

Another criterion that may be employed to select a subset of the representative images is based on the length of the scene from which the representative image was taken. For example, only representative images taken form the longest of the scenes in the video program may be retained since these scenes are presumably the most significant. For example, a video program of a speaker making a presentation before an audience may contain many longer scenes of the speaker interrupted by occasional brief shots of the audience. If the representative frames from only the longest scenes are retained, then representative frames of the speaker will be retained while the representative frames of the audience will be eliminated.

In some cases it may be desirable to eliminate representative frames associated with advertisements if the video programs are recorded from commercial television, for example. These representative frames may be easily removed because most commercials are either not captioned or are captioned in a mode different from the remainder of the video program. Accordingly, the change in caption modes can be used to detect advertisements which are to be omitted from the HTML transcript.

Another format that may be used to display HTML pictorial transcripts takes advantage of a mechanism known as server push, which is available on recent versions of the Netscape browser. Server push allows an HTML page to undergo changes while it is being viewed. This browser feature can be used to maintain a suitable page layout (e.g., a layout having a maximum number of images) without needing to eliminate sequentially occurring images. This feature, which could also be implemented using Java Animations, will be illustrated with reference to FIG. 2. FIG. 2(a) shows an HTML page of a pictorial transcript which has three sequential images 1, 2, and 3, without any intervening captions. However, suppose the page format which is selected dictates that only one image is to be displayed on a page, as in FIG. 2(b). Server push may be used display the images as shown in FIGS. 2(c)-2(e). When the page is first displayed at time t1 in FIG. 2(c), only the first image is displayed. Using server push, the second image can be displayed at a later time t2 (e.g. one second later), as shown in FIG. 2(d). At yet a later time t3 the third image can be displayed, as in FIG. 2(e). Moreover, if the network bandwidth and client and server throughput are sufficiently high, video shorts (real-time playback) can be made to appear at the caption breaks.

In many cases a user will not be interested in viewing the HTML pictorial transcript in a sequential manner. Rather, the user may be only interested in those portions of the transcript that pertain to a particular topic. In such cases the user may wish to perform a keyword search of the HTML pictorial transcript. The HTML generator can perform the search on the closed-captioned text and emphasize those portions of the transcript that contain the keyword. For example, images that appear immediately prior to and after the occurrence of a keyword may be displayed at full resolution while other images may be displayed at a smaller size and resolution. FIG. 3 shows an example of this format after a search for the word "Tokyo." The smaller images may be hypertext links to the corresponding full sized images. In some cases, particularly for large HTML pictorial transcripts, hypertext anchors may be used in place of the small images to reduce bandwidth. If the keyword appears more than once in the transcript, a chain of links may be created among the individual occurrences of the word. For example, in FIG. 3, the arrows denote a link to other occurrences of the term "Tokyo." The HTML pictorial

transcript may also include hypertext anchors to other HTML documents which contain material supplementary to, or related to, the information in the transcript.

The HTML generator may create an index page for the HTML pictorial transcript using conventional methods such as linguistic techniques, for example. FIG. 4 shows one example of such an index page, which may be located as the first page of the document. The index may contain links to the individual pages of the transcript. The index may also include other information such as index terms obtained by linguistic analysis techniques. In FIG. 4, a portion of the index is available for the user to list additional keywords to serve as index terms. The index terms may be hypertext links to those locations in the transcript where the terms appear.

Similar to the HTML documents previously discussed, HTML pictorial transcripts in which the representative frames are each associated with a corresponding audio segment may be arranged in a variety of different formats.

For example, the individual representative frames may serve as links to the audio segment. Alternatively, anchors may be associated with the representative frames. By clicking on the anchors the respective audio segments are played.

It will be appreciated that those skilled in the art will be able to devise numerous arrangements which, although not explicitly shown or described herein, embody the principles of the invention. Accordingly, all such alternatives, modifications and variations which fall within the spirit and broad scope of the appended claims will be embraced by the principles of the invention. For example, while the invention has been described as electronic data representing a condensed version of a video program that is formatted as an HTML document for the World Wide Web, the invention is more generally applicable to such data that is formatted in any hypertext language suitable for electronic retrieval on a computer or over a communications network.

We claim:

1. A method for automatically providing a compressed rendition of a video program in a format suitable for electronic searching and retrieval, said method comprising the steps of:

receiving electronic data representing a condensed version of a video program, said video program having a video component and a second information-bearing media component associated therewith, said electronic data representation including a representative frame from each segment of the video component of the video program and a portion of said second media component associated with said segment;

automatically transforming said electronic data representation into a hypertext format to form a hypertext pictorial transcript; and

recording said hypertext pictorial transcript in an electronic medium.

2. The method of claim 1 wherein said second media component is closed-caption text.

3. The method of claim 1 wherein said second media component is audio and wherein said portions of said audio component are represented by hypertext anchors.

4. The method of claim 1 wherein said hypertext format is hypertext markup language.

5. The method of claim 1 wherein said hypertext pictorial transcript comprises a plurality of hypertext pages, each of said pages having a prescribed maximum size.

6. The method of claim 5 wherein said prescribed maximum size is determined by a maximum number of frames per page.

7. The method of claim 5 wherein said plurality of hypertext pages are interconnected by hypertext links.

8. The method of claim 1 wherein said hypertext pictorial transcript has at least one standard page layout.

9. The method of claim 8 wherein said standard page layout includes a subset of representative frames selected by at least one criterion that reduces bandwidth.

10. The method of claim 9 wherein said criterion removes substantially redundant representative frames.

11. The method of claim 9 further comprising the step of replacing said substantially redundant frames with hypertext anchors.

12. The method of claim 9 wherein said criterion removes alternating ones of sequentially occurring representative frames.

13. The method of claim 9 wherein said criterion removes representative frames below a prescribed image size.

14. The method of claim 9 wherein said criterion removes representative frames above a prescribed image size.

15. The method of claim 9 wherein said criterion removes representative frames that differ from other representative frames by less than a prescribed amount.

16. The method of claim 9 wherein said criterion removes representative frames taken from segments below a threshold length.

17. The method of claim 9 wherein said criterion removes representative frames taken from advertisements.

18. The method of claim 1 wherein said hypertext pictorial transcript has a user customizable page layout.

19. The method of claim 1 further comprising the steps of generating and recording an index page to the hypertext pictorial transcript.

20. The method of claim 19 wherein said index page includes links to individual pages of the hypertext pictorial transcript.

21. The method of claim 20 wherein said index page includes hypertext index terms indexed to pages of the hypertext pictorial transcript.

22. The method of claim 1 wherein said hypertext pictorial transcript has a plurality of standard page layouts selectable by a user.

23. The method of claim 1 further comprising the step of transmitting said hypertext pictorial transcript over a communications network.

24. The method of claim 23 wherein said network is the World Wide Web.

25. The method of claim 1 wherein said hypertext pictorial transcript comprises a plurality of hypertext pages.

26. The method of claim 25 wherein said hypertext pages are divided based on topic segmentation.

27. The method of claim 25 wherein said hypertext pages are divided based on a change in closed-caption format.

28. A method for automatically providing a compressed rendition of a video program in a format suitable for electronic searching and retrieval, said method comprising the steps of:

receiving electronic data representing a condensed version of a video program, said video program having a video component and a second information-bearing media component associated therewith, said electronic data representation including a representative frame from each segment of the video component of the video program and a portion of said second media component associated with said segment;

automatically transforming said electronic data representation into a hypertext format to form a hypertext pictorial transcript; and

recording said hypertext pictorial transcript in an electronic medium.

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